DynaNotes™ Student Course Notes

CHE Chemistry

DYNA NOTES

DYNANOTES™ TOOLS FOR EXPLOSIVE LEARNING

Category 1 – Matter and the Periodic Table

CHANGES AND PROPERTIES

Change	Description	Examples
physical	change in size, shape, or state; remains the same substance	boiling water, chopping wood
chemical	new substance is made; bonds between atoms are made or broken; often see a color change, temperature change, or the formation of gas or precipitate (solid)	electrolysis of water (to H_2, O_2), burning wood (makes H_2O, CO_2)

Property	Description	Examples
physical	can be observed without changing the substance into a different substance	boiling point, color, density, solubility
chemical	can be observed when a substance changes into a different substance	reactivity with O_2, flammability, toxicity

STATES OF MATTER AND PROPERTIES

Property	Solid	Liquid	Gas
compressible	essentially no	essentially no	yes
shape	fixed	container's shape	fills space
volume	constant	constant	can chang
structure	forces keep particles in a rigid structure	intermolecular forces keep particles together but allow movement	particle freely no f

extensive property: dependent on sample size **Example** H

intensive property: independent of sample size **Exampl**

SUBSTANCES AND MIXTURES

atom: smallest complete part of an element **Ex** Helium at

element: substance made of one kind of atom ctron (–) (+)

compound: substance made of two or more different elements **Examples:** H_2O or NaCl

substance: contains only one kind of matter; no tw have identical chemical and physic properties; c broken down into different parts l mean

Examples: element like iron (F

mixture: combination of two substances in which each subst maintains its own properties; a mixt It can be separated using physical means

Example: In a fam story, Archimedes de whether the kin made of pure go mixture of met own's density, . He that if it was m then it was a ure.

PERIODIC TABLE DEVELOPMENT AND FEATURES

In 1869, Mendeleev organized k ments in order of their atomic weights, grouping those with s perties (like Li, Na, and K which all react violently with H_2O to . Over t e, other scientists added to his work to create the p ole (no d by atomic number).

valence electrons: ele an atom ost orbital shell; can be gained, lost, or sh chemi ion

periodic table: chart atomic grouped by number of valence el al and p perties vary predictably in the table ri d ve

row or period: elements are in o mic r; atomic number = number of protons = ctron neutral)

colum r group (family): elements in a ave the me number of v ectrons and have simila hysical and ch al properties; el together in a grou st similar, F and Cl (VIIA)

Type	Physical
metal	ble: ductor ttle, malleable, shiny
al rig	conductor, brittle, dull
along	conduct nder some conditions

S OF CHE MILIES

oxid mber: numbe signe m atom or ion in a substance; rep electrons gained or lo sum to 0 for neutral compound

A gains 1 electron → a F⁻ (oxidation number –1)

Ca loses 2 electrons ation Ca^{2+} (oxidation number +2)

y	Description and Oxidation Number(s)
tal	ve reactive metal; wants to lose 1 electron; +1
h metal	ive metal; wants to lose 2 electrons; +2
	active nonmetal; wants to gain 1 electron; –1
noble	nert (not readily reactive) nonmetal; has full outer shell (8 valence electrons except He has 2); 0
ansition me	metal in table's center; has partially filled shell and variable oxidation numbers (like Cu^{1+} or Cu^{2+})

ERIODIC TRENDS

Pro	Description and Trend Direction(s)
atom radius	as move left to right (protons ↑), electrons attracted inward and radii ↓; as move down column, radii ↑
nic radius	for anions (gain electrons), ionic radii ↑ (compared to atomic radii); for cations (lose electrons), ionic radii ↓
electronegativity	atom's tendency to attract electrons; ↑ as move left to right (excluding noble gases); ↓ as move down column
ionization energy	energy needed to remove an electron from an atom; ↑ as move left to right; ↓ as move down column

PERIODIC TABLE ELEME

alkali metals

alkaline earth metals

(number of protons) → 2
symbol → He
atomic mass (ns + neutrons) → 4.003
name → Helium

Example: F is most electronegative. oxidation number = –1 (always)

noble gases

halogens

left to right (cross)

• atom decreases
• electr ity increases (excluding noble gases)
• iza ergy increases

transition me

• atomic radius increases
• electronegativity decreases

Trends moving down a column

Lanthanide Series

Actinide Series

SAMPLE

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